SPLENIC ABSCESS – AN AUDIT

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CERTIFICATE

This is to certify that this dissertation in **"SPLENIC ABSCESS – AN AUDIT"** is a work done by **Dr. D.MADHUSUDHANAN,** under my guidance during the period 2006-2008. This has been submitted in partial fulfillment of the award of M.S. Degree in General Surgery (Branch-I) by the Tamilnadu Dr. M.G.R. Medical University, Chennai 600 032.

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CONTENTS

INTRODUCTION

Abscess of the spleen is a rather rare clinical entity. About 600 cases have been described so far in the international literature. Most of these refer to patients with recognized risk factors. These include the synchronous presence of conditions that compromise the immune system, such as endocarditis, diabetes mellitus, congenital or acquired immunodeficiency and the administration of immunosuppressive medication. Trauma is an additional predisposing factor for splenic abscesses.

Instances of splenic abscesses are relatively increased among intravenous drug addicts. On the other hand, splenic abscesses are most uncommon in the general population. From an epidemiological point of view, they are more frequently detected in middle-aged and older individuals, with more preference for male sex.

The clinical manifestations of splenic abscesses usually include abdominal pain, exclusively located or, at least, more intensely described in the upper-left-quadrant area. Fever, nausea, vomiting and anorexia may be also present in various combinations. Laboratory findings are consistent with the acute phase of infection, but their exact nature is

determined by the pathogen isolated from the abscess. The most common pathogens detected include *Staphylococcus* and *Streptococcus*. Imaging by common abdominal X-ray or ultrasound may be suggestive, but the lesion is usually revealed *via* computed tomography (CT). Due to the seriousness of the potential implications, including a threat to life itself, the most usual treatment currently applied is splenectomy, which is followed by rapid clinical improvement.

The high mortality associated with delayed diagnosis emphasizes the need for prompt detection and early treatment. Recent reports have stressed the changing clinical spectrum and treatment of splenic abscess. Non surgical management of splenic abscess have changed approaches to diagnosis and therapy.

SPLENIC ABSCESS

DEFINITION; Splenic abscess is defined as an infectious suppurative process involving identifiable macroscopic filling defects either in the parenchyma of the spleen or the subcapsular region of the spleen.

To understand the spectrum of splenic abscess, it is better to understand the applied anatomy and functions of spleen.

APPLIED ANATOMY OF SPLEEN

The spleen develops from mesenchymal cells in the dorsal mesogastrium during the fifth week of gestation. The spleen is located in the posterior left upper quadrant of the abdomen. The convex smooth surface of the spleen faces superiorly, posteriorly, and to the left in relation to the abdominal surface of the diaphragm. The diaphragm separates the spleen from the pleura, the left lower lobe of the lung, and the adjacent 9th, 10th, and 11th ribs. The costo- diaphragmatic recess of the pleura extends down as far as the inferior border of the normal-sized spleen.

The normal size and weight vary somewhat; in adults, the approximate size of the spleen is 12 cm in length, 7 cm in width, and 3 to

4 cm in thickness. The average spleen weight in an adult is 150 g, with a range of 80 to 300 g.

The visceral relationships of the spleen are with the proximal greater curvature of the stomach, the tail of the pancreas, the left kidney, and the splenic flexure of the colon. The parietal peritoneum adheres firmly to the splenic capsule, except at the splenic hilum.

The peritoneum extends superiorly, laterally, and inferiorly, creating folds, which form the suspensory ligaments of the spleen. The spleno-phrenic and spleno-colic ligaments are usually relatively avascular. The spleno-renal ligament extends from the anterior left kidney to the hilum of the spleen as a two-layered fold in which the splenic vessels and the tail of the pancreas are invested. These two layers continue anteriorly and superiorly to the greater curvature of the stomach to form the two leaves of the gastro-splenic ligament through which the short gastric arteries and veins course.

A fibroelastic capsule commonly known as the splenic capsule invests the organ, and from it trabeculae pass into the parenchyma, branching to form a trabecular network that subdivides the organ into small compartments.

ARTERIAL SUPPLY:

The splenic artery is a tortuous vessel that arises from the celiac trunk; it courses along the superior border of the pancreas. The branches of the splenic artery include the numerous pancreatic branches, the short gastric arteries, the left gastro-epiploic artery, and the terminal splenic branches. The splenic artery divides into several branches within the spleno-renal ligament before entering the splenic hilum, where they branch again into these trabeculae as they enter the splenic pulp.

Small arteriolar branches leave the trabeculae, and their adventitial coat becomes replaced by a sheath of lymphatic tissue that accompanies the vessels and their branches until they divide into capillaries. It is these lymphatic sheaths that make up the white pulp of the spleen and that are interspersed along the arteriolar vessels as lymphatic follicles. The interface between the white pulp and the red pulp is known as the *marginal zone.* As the arterioles lose their sheaths of lymphatic tissue, they traverse the marginal zone and enter the red pulp, which is composed of large branching, thin-walled blood vessels called *splenic sinuses* and *sinusoids,* and thin plates of cellular tissue composing the splenic cord.

VENOUS SUPPLY :

The venous sinusoids empty into the veins of the red pulp, and these veins drain back along the trabecular veins that empty into at least five major tributaries, ultimately joining to form the splenic vein in the spleno-renal ligament. The splenic vein runs inferior to the artery and posterior to the pancreatic tail and body. It receives several short tributaries from the pancreas. The splenic vein joins the superior mesenteric vein at a right angle behind the neck of the pancreas to form the portal vein. The inferior mesenteric vein often empties into the splenic vein; it may also empty into the superior mesenteric vein at or near the confluence of the splenic vein and superior mesenteric vein.

ACCESSORY SPLEEN

Accessory spleens, made of blood, sinuses, and malphigian bodies, have been classified into two types: (1) the more uncommon is a constricted part of the main organ to which it is bound by fibrous tissue, and (2) the more common is a distinct, separate mass.

The latter has been reported in 14–30% of patients, with a higher incidence in patients with hematologic disorders. These

accessory organs receive their blood supply from the splenic artery. They are present in decreasing order of frequency in the hilum of the spleen, the gastro-splenic ligament, spleno-renal ligament, and the great omentum

Accessory spleens may also occur in the pelvis of the female, either in the pre-sacral region or adjacent to the left ovary, and in the.scrotum in juxtaposition to the left testicle.

WHITE PULP & RED PULP

The parenchyma is made up of "white pulp" that functions as an immunologic organ, "red pulp" that phagocytizes particulate matter from the blood, and a marginal zone. The white pulp, which is central and surrounds a central artery, is made of lymphatic nodules with germinal centres and peri-arterial lymphatic sheaths that constitute a reticular network filled with lymphocytes and macrophages. Peripheral to the white pulp is the marginal zone that contains end arteries arising from the central artery and from peripheral penicilliary arteries. The marginal zone contains lymphocytes and macrophages and red blood cells (RBCs) that have exited from terminal arteries. The marginal zone also contains the

marginal sinus that filters material from the centrally located white pulp. Locally produced immunoglobulins enter the marginal zone, eventually coursing to the blood stream

Peripheral to the marginal zone is the red pulp. This pulp consists of cords and sinuses that contain cellular elements of blood in transit. Most of the blood flow passing through the spleen courses through an "open" circulation in which the blood passes from arterioles to reticular cell-lined networks of the splenic cords and to the sinuses.

FUNCTIONS OF SPLEEN

Splenic function has historically been summarized as:

(1) Filtration, (2) host defence, (3) storage, and (4) cytopoeisis.

Total splenic inflow of blood is approximately, 250–300 ml/min.

FILTRATION: As blood enters the red pulp, its rate of flow through the spleen can vary greatly. The filtration function of the spleen occurs primarily via the slower circulation. In open circulation, blood percolates through reticular space and splenic cords, gaining access through gaps or slits in the endothelial cell lining to venous sinuses. Blood is thus exposed to extensive contact with splenic macrophages.

Plasma is not similarly slowed during its passage through these spaces. Thus, temporary and unique adhesive

Contact between blood cells and components of the splenic cord may occur. Further evidence of the selective slowing of blood cell flow versus plasma flow is indicated by a concentration of erythrocytes (hematocrit) twice that of the general circulation within the spleen. It is likely during this contact with splenic macrophages that removal of cellular debris and senescent blood cells occurs,

The spleen is the major organ clearing damaged or aged red blood cells and it also plays a role in removing abnormal white blood cells and platelets. During an erythrocyte's 120-day life cycle, a 2-day minimum is spent sequestered in the spleen, in which approximately 20 ml of aged red blood cells are removed daily.

HOST DEFENCE: The spleen plays a significant, although not indispensable role in host defence, contributing to both humoral and cell-mediated immunity. Antigens are filtered in the white pulp and presented to immunocompetent centres within the lymphoid follicles, giving rise to the elaboration of immunoglobulins (predominantlyIgM). Such an acute IgM response results in the release of opsonic antibodies from the **spleen's**

white pulp. Clearance of the antigen by the splenic and hepatic reticuloendothelial (RE) systems then occurs.

The spleen also produces the opsonins, tuftsin and properdin. Tuftsin, a likely stimulant to general phagocytic function in the host, appears to specifically facilitate clearance of bacteria. Circulating monocytes converted into fixed macrophages with the red pulp account for the spleen's remarkable phagocytic activity.

The spleen also appears to be a major source of properdin, the protein important in the initiation of the alternate pathway of complement activation. The splenic RE system is better able to clear bacteria poorly or inadequately opsonized from the circulation than is the hepatic RE system.

STORAGE: Blood of cell types are stored in the spleen. Under normal circumstances one third of the total platelet pool is sequestered in the spleen. Thrombocytopenia may result from excessive sequestration of platelets and accelerated platelet destruction in the spleen. Splenomegaly may result in sequestration of up to80 percent of the platelet pool. The spleen may also contribute to the immunologic alteration of platelets, leading to thrombocytopenia in the absence of Splenomegaly.

CYTOPOIESIS: Spleen contributes to the proliferative phase of haemotopoiesis, particularly in fetus, but also in later life. Also spleen is clearly a major site for antigen-stimulated proliferation and maturation of T and B lymphocytes, thus helping in lymphopoiesis.

REVIEW OF LITERATURE

EPIDEMIOLOGY OF SPLENIC ABSCESS

The actual incidence of splenic abscess is very difficult to assess. Autopsy studies suggest an incidence of 0.14% to 0.17%. Its reported mortality rate is still high, up to 47%, and can potentially reach 100% among patients who do not receive antibiotic treatment. Appropriate management can decrease the mortality to 14%. The incidence may depend on the study population. For example, the incidence of splenic abscesses in Denmark was 0.056% per 1,000 somatic hospital discharges per year or 0.0049% per year of all hospital deaths. In a series of 18,960 computerized tomograms (CT) of abdomen only three cases of splenic abscess were found, thus depicting the rarity of splenic abscess.

Sex Ratio

World literature suggests male predominance, and the male: female ratio is 2:1.

All age groups can be affected, most typically after the fourth decade.

ETIOLOGY OF SPLENIC ABSCESS

Splenic abscesses have diverse etiologies. The most common is hematogenous spread originating from an infective focus elsewhere in the body. Infective endocarditis, a condition associated with systemic embolization in 22-50% of cases, has a 10-20% incidence of associated splenic abscess. Other infective sources include typhoid, paratyphoid, malaria, urinary tract infection, pneumonias, osteomyelitis, otitis, mastoiditis, and pelvic infections. Pancreatic, other retro peritoneal, and subphrenic abscesses, as well as diverticulitis, may contiguously involve the spleen. Splenic trauma is another well-recognized etiologic factor. Splenic infarction resulting

From systemic disorders, such as hemoglobinopathies (especially sickle cell disease), leukemia, polycythemia, or vasculitis, can become infected and evolve into splenic abscesses.

Alcoholics, diabetics, and patients who are immunosuppressed are among the most susceptible to splenic abscesses.

Spleen is an effective filter for organisms and particulate matter and, as can be seen from the very low incidence of splenic abscess, is very resistant to infection.

The causes of splenic abscess often fall into one of the five categories:

1. Metastatic Infection from elsewhere in the body is the most common cause for splenic abscess and staphylococcus aureus as the offending organism**.** Endocarditis is a common focus for the bacteraemia and occasionally is associated with IV drug abuse .other foci include intraabdominal sepsis ,especially after bowel or gastric surgery, chest infection, osteomyelitis, infected vascular access sites, infected ventriculoperitoneal shunts, skin lesions, or with tooth extractions.

2. Contiguous infection may result in a splenic abscess by direct spread, for example secondary to a perinephric abscess or direct involvement of a colonic carcinoma. Conversely, a splenic pathology may invade into an adjacent organ and be secondarily contaminated (eg, rupture into the stomach by lymphoma of the spleen).occasionally, a splenic abscess may occur from retrograde portal pyemia, for example, after percutaneous ethanol injection therapy for hepatocellular carcinoma or injection sclerotherapy for oesophageal varices. Pancreatic, other retroperitoneal, and subphrenic abscesses, as well as diverticulitis, may contiguously involve the spleen

3. Secondary infection of spleen infarction can occur with clot embolization in cardiac arrhythmia or bacterial end result in Endoocarditis, lipid embolisation with Weber Christian disease or Iatrogenic splenic artery embolisation for treatment of autoimmune haemolytic anaemia. Splenic infarct from thrombosis of splenic vessels may be associated with leukaemia, sickle cell disease, hemoglobinopathies like thalassemia unexplained thrombocytosis, or after pancreatitis.

4. Trauma to the spleen including procedural or Iatrogenic, may result in splenic abscess and have reported in gastric surgery, attempted splenic conversation in distal pancreatectomy, Endoscopes Retrograde Cholangiopancreatography , percutaneous nephrostomy, and therapeutic splenic arterial embolisation for autoimmune haemolytic anaemia and hypersplenism. Also with increasing enthusiasm to conserve the spleen in splenic trauma and splenic conservation technique like exploration only and mesh splenorrhaphy have resulted in abscess in devitalised or necrotic splenic tissue in some patients.

5. Immunodeficiency is a major factor in the course of splenic abscess, especially when fungi or unusual organisms are involved. Immunodeficiency has lead to increase in fungal abscess during last

century, from 0.8% to 25.8 %. Intravenous drug abuse, AIDS, Neutropenia secondary to chemotheraphy, and immunosuppression therapy with renal transplantation are increasingly being recognised as contributory causes.

In recent reviews, 18% to 25.8% of splenic abscess are immunosuppressed

Disease processes like SLE,FELTY'S syndrome, End stage renal disease, infectious mononucleosis, and cancers like multiple myeloma and leukemia have been reported with splenic abscesses.

CONDITIONS ASSOCIATED WITH SPLENIC ABSCESS

LEUKEMIA
CHEMOTHERAPY
CONCOMINANT INFECTION
DIABETES MILLETUS
LIVER DISEASE
CARDIOVASCULAR DISEASE
SYSTEMIC LUPUS ERYTHEMATOSUS
CANCER
POST ABDIMINAL OPERATION
ANEMIA
RENAL INSUFFICIENCY
CORTICOSTEROIDS
ALCOHOLISM
IATROGENIC CUSHING'S DISEASE
THYROID DISEASE
SPLENIC INFARCTION
SPLENIC ARTERY ANEURYSM
PEPTIC ULCER
ASTHMA

CLINICAL PRESENTATION

The signs and symptoms of splenic abscess have been well described but are not very specific. Therefore, splenic abscess remains a substantial diagnostic challenge. The classical triad of fever, left upper quadrant pain, and splenomegaly is seen in only about one third of patients.

The symptoms of splenic abscess can be variable and depend on the location, size, and progression of the process. They can also be acute, subacute, or chronic. Deep-seated, small abscesses can be painless and accompanied by septic symptoms.

- Fever (>90%) can be moderate, continuous, intermittent, or even absent.
- Abdominal pain (>60%) typically occurs suddenly, with a punctum maximum in the left hypochondrium (>39%). Remember that pain usually signifies perisplenitis.
- Involvement of the diaphragmatic pleura can cause shoulder pain. The associated eponym is the Kehr sign, although there is no clear demonstration that Kehr either described it or suffered from it.

- Pleuritic chest pain around the left lung base (>15%) is aggravated by coughing or forced expiration.

- General malaise and other constitutional and dyspeptic symptoms can be included, all of which can also be seen in a variety of other septic conditions.

Symptoms	Signs
Fever	leucocytosis
Chills	abdominal tenderness
Abdominal pain	splenomegaly
Weakness	hepatomegaly
Anorexia	weight loss
Nausea,vomiting, diarrhoea	
Left Chest Pain	
Confusion	

Physical examination

- Abdominal tenderness (>50%) may or may not be accompanied by muscle guarding in the left upper quadrant. There may be oedema of the soft tissues overlying the spleen. Cost vertebral tenderness may also be noted.

- Splenomegaly (<50%) is less frequently observed, probably because of early diagnosis resulting from the widespread use of imaging methods.

Chest findings are non-specific and reportedly include dullness at the left lung base (>30%), left basilar rales (>21%), or elevation of the left hemi diaphragm (>15%).

The non specific nature of the signs and symptoms of splenic abscess make imaging modalities a corner stone for diagnosis

INVESTIGATIONS

ROLE OF BLOOD INVESTIGATIONS

Estimation of white blood cell counts is unreliable and is seldom markedly raised, probably due to previous antibiotic therapy. Some studies have found invariable leucocytosis, Levels of leucocytosis were of no value in diagnosis, estimation of severity of disease, or prediction of outcome. Unexplained, thrombocytosis has been suggested to be useful in suspecting splenic abscesses in sepsis syndrome or septic shock where platelet counts are not usually elevated. In addition, the finding of thrombocytosis may elucidate the underlying pathology and the associated splenic infarction as a predisposition for abscess formation.

The low incidence of bacteraemia despite a high culture positive rate from the abscess suggests that previous empirical antibiotic therapy may be inadequate or inappropriate in eradicating organisms from the abscess despite clearing the blood. The significant proportion of dissimilar organisms cultured from the blood and pus and the increasing incidence of rarer organisms, make the choice of antibiotics difficult, and perhaps support the need for culture appropriate ant microbial therapy, especially in the immunosuppressed patients

MICROBIOLOGY

The most common organisms obtained from culture of the abscesses is aerobic microbes in particular staphylococci, streptococci, E.coli and salmonella.

In an intensive care unit setting **enterococci** are more common, and may reflect previous antibiotic therapy eradicating the most common organisms. Anaerobic organisms are less frequently encountered and this may be due to the difficulty in culturing these fastidious microbes. In the tropics where melioidosis is common , pseudomonas is being increasingly reported with splenic abscesses. Although rare before 1970, mycobacteria like tuberculosis, avium intracellular, and fungi like candida, aspergillus, auerobasidium pullulans, blastomyeces dermatitis, and cryptococcus neoformans are being increasingly reported in immunosuppressed patients, especially those with AIDS or after chemotherapy.

Also culture could be negative in almost 30% of cases

A wide range of less common microbes cultured from splenic abscesses is as follows

- Aerobes (in most published cases)
  - Gram-positive cocci -*Streptococcus*, *Staphylococcus, Enterococcus* (predominant in most reports)
  - Gram-negative bacilli -*Escherichia coli, Klebsiella pneumoniae, Proteus, Pseudomonas* species, *Salmonella* species (occasionally predominant)
- Anaerobes -*Peptostreptococcus, Bacteroides, Fusobacterium, Clostridium, Propionibacterium acnes*
- Polymicrobial (up to 50% of cases)
- Fungal -*Candida*
- Unusual flora -*Burkholderia pseudomallei* (occasionally reported in melioidosis), actinomycotic and mycobacterial abscesses

ROLE OF IMAGING STUDIES

Role of X-Rays ; The diagnosis of splenic abscess may be suggested by a plain abdominal x-ray (AXR) Showing

- A soft tissue mass in the left upper quadrant,
- Displacement of gastric bubble, splenic flexure gas shadow, or left renal outline,
- Extra-alimentary gas or an air fluid level in the left hypochondrium
- Elevation of the left hemi diaphragm, and
- A left pleural effusion.

Though the AXR is abnormal in about 25% of patients, the findings are usually non-specific or variable, and never diagnostic. Chest x-rays (CXR) are abnormal in about 50% to 80% of patient and may support the findings on AXR, Common CXR findings include left sided pleural effusion, basal atelectasis, and an elevated hemidiaphragm.

Radio nuclide scans

Radio nuclide scans were the investigations of choice in the era before ultrasonography (US) and CT. Technetium 99m sulphur-colloid (99mTc-sc) liver-spleen scan in the imaging most commonly used, and shows a focal photogenic defect *or* delayed uptake Although false negatives occur, the-99mTc-sc scan is considered invaluable in diagnosis, and by itself may be sufficiently conclusive to warrant surgical exploration for splenic abscess.

For multiple splenic abscess, however, ^{99m}Tc-sc scan is frequently undiagnositic. Gallium 67 citrate (^{67}Ga-c) scans can be useful , and demonstrate a focal uptake in the spleen, occasionally with a perisplenic halo. False positive occur with uptake by normal splenic tissues, a hyperactive spleen or with lymphoma. These, and a required procedural time of upto 72 hours, limit the usefulness of be Ga-c scan.

Indium-Ill leukocyte (111In-wbc) scans, and ^{99m}Tc hexamethylypropylene amineoxine-labeled white blood cell (^{99m}TcHMPAO-wbc) scans have been used occasionally, may be diagnostic for splenic abscesses.

ULTRASOUND ABDOMEN

Ultrasonography is considered to be the imaging modality of choice for diagnosis of splenic abscess by some because of the relatively low cost, easy availability, and portability, and certainly has a role in the initial assessment of any patient suspected of having an abscess in the spleen.

The majority of lesions demonstrated an anechoic or hypoechoic pattern, with an irregular wall, associated splenomegaly, and occasionally, with mixed echogenic foci or hyper echoic gas patterns within the lesion. These features are similar to those for abscesses in other abdominal organs, and are not path gnomonic of splenic abscess.

The application of colour Doppler flow imaging demonstrates an avascular lesion with no hypervascularism, but does not increase significantly the distinction from a splenic tumour or infarct. In some situations, the use of US-guided fine needle aspiration for cytology and culture may be needed to differentiate between splenic-abscess, infarct, and tumor.

CT - SCAN ABDOMEN

CT- SCAN is the most accurate modality for imaging the spleen. With a reported sensitivity of 96%, CT is superior to US and radionculide scans. CT defines the exact location of the abscess better than US, and is able to demonstrate sub-capsular or perisplenic pathology. The classic CT appearance is a hypo dense lesion with a density range of 18 to 30 HU, sometimes multiple and occasionally containing gas.

CT - SCAN is superior in its ability to localise lesions as small as several millimetres, and gives better anatomic information about the perisplenic area and contiguous viscera. Thus USG and CT-SCAN are both sensitive in detecting splenic abscess, although neither of two is specific.

The **differential diagnosis** includes **splenic infarcts, cysts, primary and secondary tumours, hematomas and lymphomatous masses.**

With the advent of USG and CT- SCAN , Intraabdominal abscesses are more often treated with percutaneous puncture and closed drainage, and treatment success has been reported with this modality.

MRI ABDOMEN

Newer imaging modalities like magnetic resonance *imaging* (MRI) have been used in the diagnosis of intra abdominal abscesses in solid organs like the liver. Features of all solid organ abscesses in the abdomen are expected to be similar. MRI SCANS to some extent can differentiate between bacterial and fungal abscess .Fungal abscess are seen clearly on T2 – Weighted fat-suppressed images as high signal intensity rounded foci. Bacterial abscesses are larger than fungal lesions due to the high protein content, they were of mixed high- signal intensity on T2- weighted images and had substantial perilesional enhancement on gadolinium- enhanced images.

The high sensitivity of US and CT combined, and the ready availability of these investigations, however, limits the applicability of MRI in the diagnosis of splenic abscesses and its use is doubtful at this stage.

TREATMENT

Once the diagnosis of splenic abscess has been made , the patient should be admitted in hospital and treated. The treatment depends upon the patients overall condition, comorbidities,and primary disease (if any), as well the size and topography of the abscess.

There are different methods for treatment of splenic abscess such as antibiotics alone, or percutaneous drainage of abscess, pig tail catheter insertion and drainage, and splenectomy. Always splenectomy is the definite method for splenic abscess. The non surgical management of splenic abscess is on the rise, due to recent advances in drainage procedure . **Zerem et al** , has suggested that solitary abscesses of size less than 5mm can be drained by percutaneous drainage and abscess of size greater than 5mm size can be drained with pig tail catheter. Ultrasonographic or CT-guided drainage has a reported success rate of more than 75% and is suitable for the critically ill where surgery is contraindicated or in young patients where splenic preservation is desirable but management must be invidualised depending upon the clinical presentation.

ANTIBIOTICS

The introduction of antibiotics significantly reduced the mortality from splenic abscesses..Emperic broad spectrum antibiotics have a primary role in the initial management of splenic abscess. The success of antibiotic therapy is not affected by presence of multiple abscess or polymicrobial flora. The choice of antibiotics is tailored mainly to the culture report. Antibiotics were effective in clearing bacteraemia, although organisms in the abscess were not eradicated and could still be cultured. An anecdotal success with antibiotic therapy alone, has been reported recently in patients considered unfit for surgical intervention, but is the exception rather than the rule.

Initial successes with antibiotic therapy alone can be complicated months later by recurrent abscess formation requiring splenectomy. At present, medical therapy alone is appropriate initially for fungal abscesses. Recently , this has been successfully confirmed using serial USG and CT scans that demonstrate fungal abscess resolution with Amphotericin B therapy.

Percutaneous pigtail catheter drainage

Through a small skin incision, the pigtail catheter (SIZE 8 Fr or 10 Fr)is introduced into the abscess cavity, and fluid samples were sent for microbiologic evaluation . The drainage technique adopted is the trocar method using pigtail catheters.

Careful localization of the lesion and proper selection of the entry site are required. An optimal route of access must traverse the least possible amount of splenic parenchyma and avoid the bowel and pleura. Post drainage scans should be done to exclude early complications (e.g., hematoma, pneumothorax)

Percutaneous drainage is most apt to succeed when the abscess collection is unilocular or bilocular, with a discrete wall and no internal septations, and when its content is liquefied enough to be drained and located at the periphery and at the middle or lower pole of the spleen. The number of the collections is an important factor. If there are more than two collections, surgical treatment is preferred.

In multilocular abscess, placement of a single catheter primarily and the hydrostatic pressure gradient that is created when one of the cavities is drained may sometimes cause spontaneous drainage of the

other cavities. The possibility of placing an additional catheter should always be examined if the abscess persists.

Multilocular abscesses with thick septations or necrotic debris are less amenable to percutaneous drainage. Likewise phlegmonous, poorly defined cavities, or multiple small deep collections are also generally not curable by this approach. Nevertheless, in the presence of a complex abscess that is treated percutaneously, an improvement of the patient's general condition and no adverse effect on subsequent surgery may be noted.

Percutaneous drainage is indicated especially when patients are in critical health postoperatively or when the risks of general anaesthesia, surgical drainage, or splenectomy are substantial. Some authors report that percutaneous drainage should be considered as a first line of treatment, reserving splenectomy for only exceptional cases.

The advantages of percutaneous drainage compared with surgery include external drainage without significant risks of intra -abdominal spillage, avoidance of perioperative complications, conservation of time and expense, better acceptance by the patient, and easier nursing care. Also, immunologic dysfunction after splenectomy is avoided, and this outcome is desirable, especially in young patients.

Removal of the catheter is advocated when there is minimal draining fluid (<5 ml daily), the patient is symptom-free, and imaging of the spleen reveals no residual cavity. Failures with both aspiration and catheter drainage can be successfully treated by splenectomy.

Complications associated with percutaneous drainage of splenic abscesses include haemorrhage, pleural empyema, pneumothorax n pleural catheterisation), and fistula.

Contraindications

Absolute contraindications to percutaneous drainage include the following:

- Multiloculated or debris-filled abscess
- Multiple small abscesses
- Uncontrollable coagulopathy
- Poorly defined abscess on CT scan or ultrasound
- Diffuse ascites
- No safe route for drainage

Relative contraindications to percutaneous drainage include the following:

- Splenic abscesses secondary to spread from a contiguous process, such as other large primary abscesses (eg, pancreatitis, perforated colon cancer) that cannot be eradicated by this method
- Abscess rupture
- A phlegmonous or poorly characterized lesion on CT scan or ultrasound

SPLENECTOMY

In the early part of the century, surgical treatment for splenic abscesses was by splenotomy, but is now replaced by splenectomy as the treatment of choice. Occasionally, surgical drainage is performed in situations where extensive intraabdominal adhesions preclude a safe splenectomy, or when splenic rupture has resulted in a subphrenic abscess.

Preoperative Preparation

In most instances, there is no specific treatment required for the preoperative management of patients undergoing splenectomy.

In elective cases, vaccines against *Streptococcus pneumonia*, *Haemophilus influenza* type B, and *Neisseria meningitides* are administered 14 days before operation and as soon as possible for emergency cases. An oro- gastric tube is used during the operation to decompress the stomach and to facilitate transection of the short gastric veins.

Operative Technique

A variety of incisions may be used, depending on the nature of the disease and the personal preference of the surgeon. The midline incision is preferred, although a left sub- costal incision is favoured by some surgeons, especially in children.

Palpation is carried out to detect any inflammatory adhesions to the spleen that might cause a capsular tear and troublesome bleeding if not carefully divided. The spleen is mobilised by dividing its posterior ligamentous attachments by electrocauterisation.

First, the spleen is separated from the renal covering with the use of sharp and blunt dissection. The spleno-colic and spleno-renal ligaments are clamped, divided and safely ligated. The short gastric vessels are clamped, divided and suture-ligated, avoiding injury or ischaemia of the stomach. Then the spleen is mobilised toward the midline before the hilar vessels are secured, a technique applicable for normal-sized, slightly enlarged or ruptured spleens. The spleen, tail and part of the pancreas are elevated, with extra care being paid to the tail of the pancreas. The spleen is now outside the peritoneal cavity

and is attached only by the branches of the splenic arteries and veins.

Initial ligation of the splenic artery and vein along the upper edge of the pancreas before splenic mobilisation is a very useful technique in patients with massive splenomegaly, because it controls the major portion of the vascular supply, and allows safer mobilisation of the spleen and dissection of its hilar branches. Still, it may predispose to splenic and portal vein thrombosis, encountered in a percentage of patients undergoing splenectomy.

Use of drains for a few days to reduce the subphrenic accumulation of fluid that occurs in the space previously occupied by the spleen. Closed suction drainage is indicated whenever an injury to the tail of the pancreas occurs as well as for patients where incomplete haemostasis is suspected.

COMPLICATIONS OF SPLENIC ABSCESS

- Rupture into the peritoneal cavity - most common complication
- Rupture into a contiguous organ can result in a lienogastric or lienocolic fistula.

- Rupture into trans-diaphragmatic rupture leads to spleno-bronchial fistula

- Empyema thoracis

AIM OF THE STUDY

This study is done to look into the incidence, etiology, evaluation protocols, treatment strategies, morbidity and associated mortality with splenic abscess

MATERIALS AND METHODS

Study type

Retrospective study of prospectively maintained database obtained from the medical records department of the hospital, from March 2004 to October 2008. Radiological and microbiological archives of the hospital were utilised for obtaining evaluation details.

Patients

A total of 23 patients were included in the study , 17 were male and 6 were female patients.

Data collection

A standardised departmental protocol preformed was used for this study. (Refer Annexure).

Data analysis

The obtained information were computed and statistical analysis were done.

DIAGNOSTIC CRITERIA

- Microbiologically documented abscess (blood or splenic aspirate) with compatible splenic imaging studies of CT or USG

- Pathological microscopic examination of the spleen post resection or aspirate that revealed abscess formation

- Operative findings of splenic abscess on exploratory laporatomy.

- In the presence of clinical manifestations and findings of CT or USG.

OBSERVATION AND RESULTS

A total number of 23 cases of splenic abscess were analysed and the following results were obtained

Demography

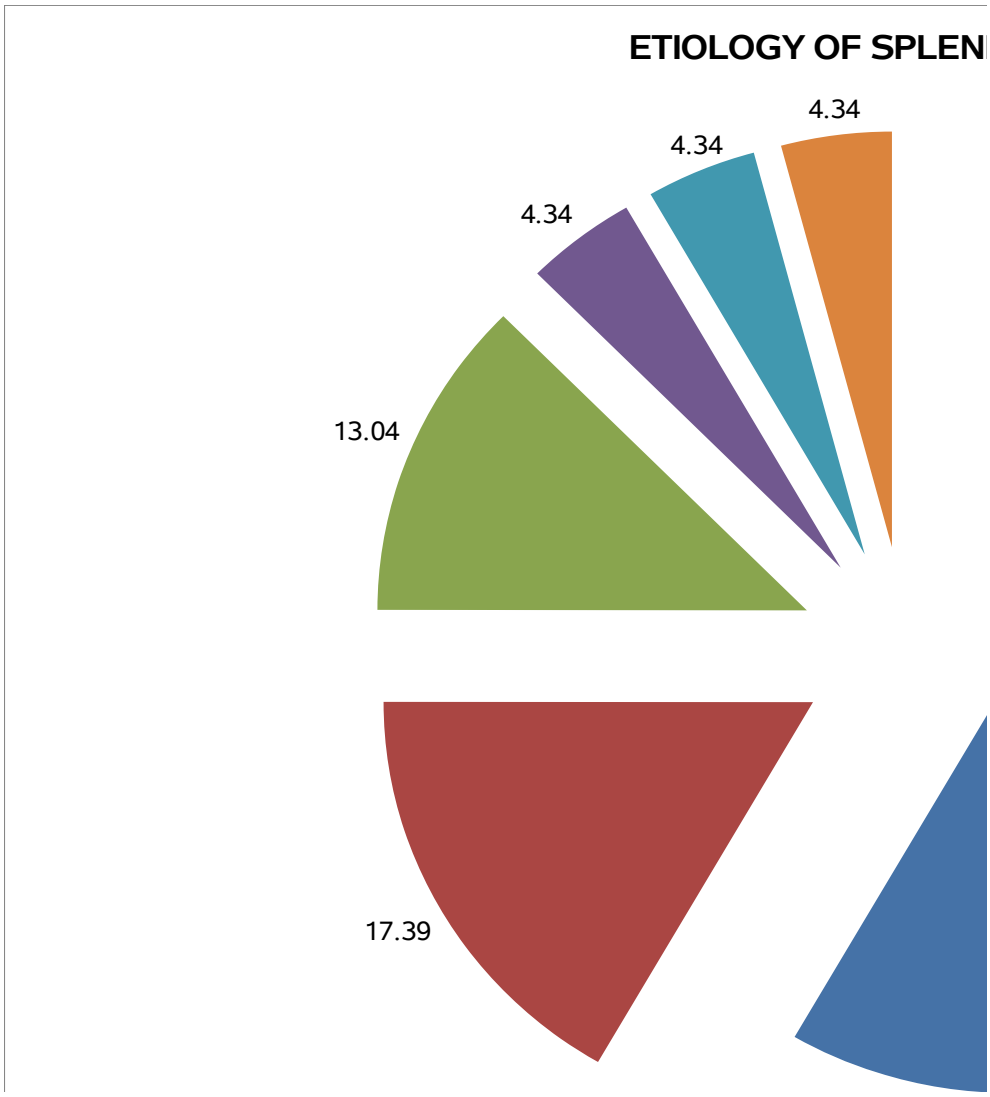
Out of 23 cases , 17 were male and 6 were female . The mean age group was 36(16- 68).

Etiology

In 14 patients a definite cause could not be established. Four of the patients developed splenic abscess following abdominal trauma, HIV was found in 3 cases, one of them had SLE, one of them had chronic renal failure and one developed after pancreatitis.

ETIOLOGY FOR SPLENIC ABSCESS

CAUSES	NUMBER	
UNKNOWN	14	60.86%
TRAUMA	04	17.39%
HIV	03	13.04%
SLE	01	4.34%
CRF	01	4.34%
PANCREATITIS	01	4.34%


ETIOLOGY OF SPLEN
4.34
4.34
4.34
13.04
17.39

Even in 14 patients whose etiology could not be established,9 patients had an immunosuppressive co morbid condition. Diabetes mellitus was associated in 7 patients and 2 patients were on long term steroids. Two patients were treated case of pulmonary tuberculosis.

4 (17.39%) patients who had trauma ,were conservatively treated for subcapsular splenic hematomas ,following which they developed splenic abscess.

HIV-ELISA was positive in three (13.04%) patients, and was diagnosed in the process of laboratory evaluation for splenic abscess.

Chronic renal failure patient and SLE patient were taking steroids for a long period of time.(for more than 10 years)

The patient who developed splenic abscess due to pancreatitis , was chronic alcoholic for 20 years and was recovering from acute narcotising pancreatitis.

Clinical presentation

Majority of patients presented with abdominal pain and fever. Abdominal pain was present in 20 cases. The pain was dull aching in type, and was mainly confined to left upper abdomen.

Out of 23 patients, fever was present in 21 cases . . Acute infections had spiking temperature with chills and rigor. Chronic infection patients presented with low grade fever. Fever were conforming to causes of abscess

Spleen was clinically palpable in 5 patients, two patients had tender splenomegaly .one patient who was an old case of tuberculosis, presented with left pleural effusion along with splenic abscess. .

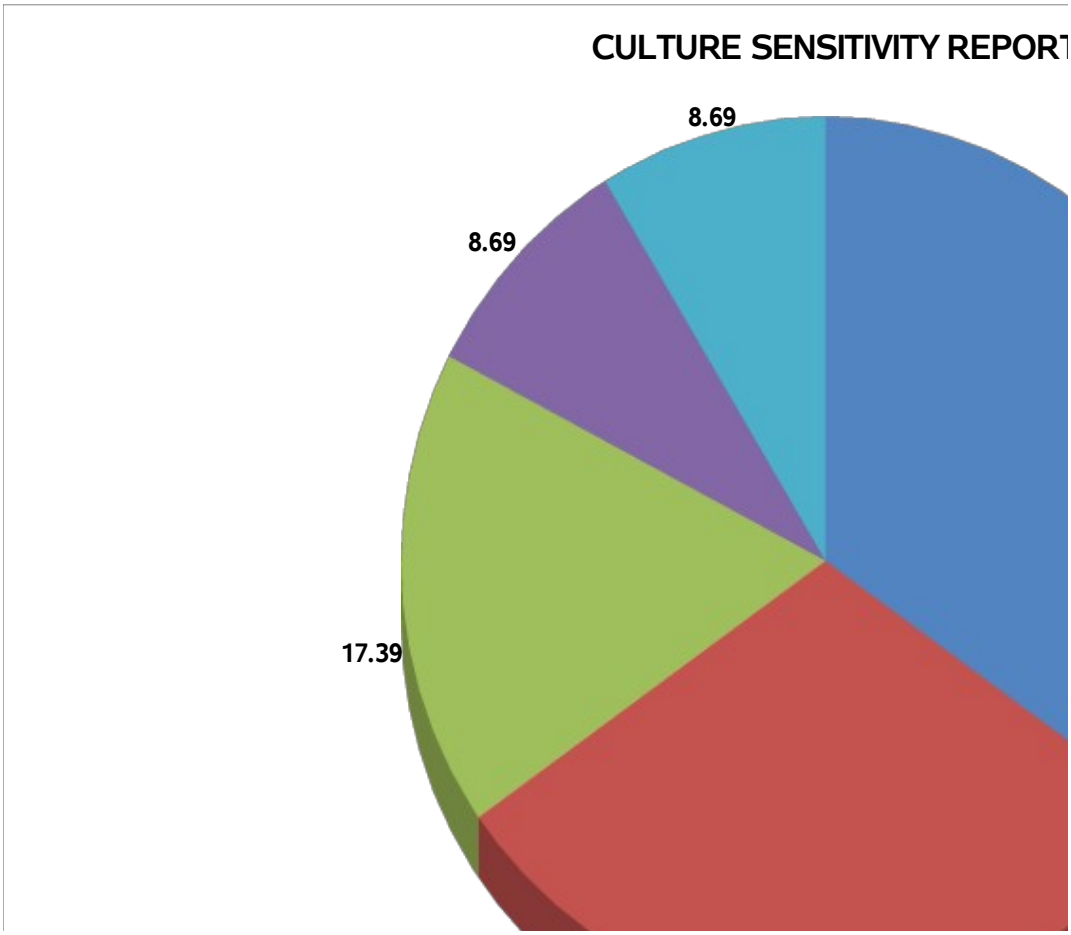
Investigations

All patients underwent blood investigations, such as Hemogram, Blood sugar, Blood urea, Serum creatinine,Urine analysis, LFT &Serum amylase ELISA for HIV, Blood&pus for Culture and sensitivity. Hemogram revealed leucocytosis in majority of patients. HIV was positive for 3 patients.

On Analysing laboratory culture data, Staphylococci was the cause for abscess in 10 patients, Streptococci in 7, E.Coli in 4 cases and salmonella in 2 cases. Two patients had mycobacterium tuberculosis.

Culture Sensivity of Patients

Organism	**Number of patients**
Staphylococci	08(34.78%)
Streptococci	07(30.43%)
E.coli	04(17.39%)
Mycobacterium	02(8.69%)
Salmonella	02(8.69%)

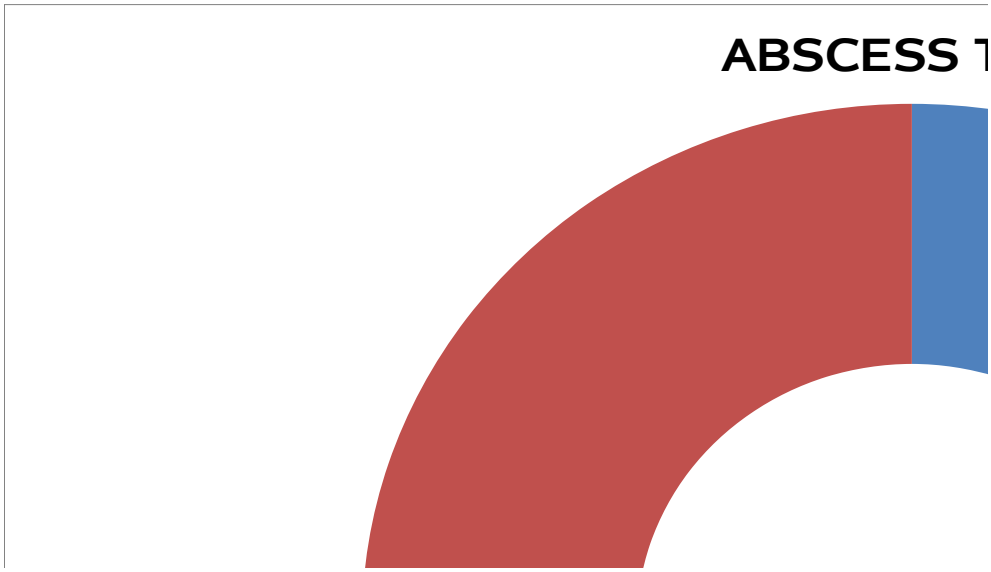

CULTURE SENSITIVITY REPORT
8.69
8.69
17.39

X-Ray Chest& X- Ray Abdomen erect and supine was done in all patients and it was not contributory. One patient had pleural effusion.

USG Abdomen in expert hands was able to pick up most of the cases of splenic abscess. The common finding in the study group was an anechoic or hypoechoic abscess cavity, with irregular wall, and associated splenomegaly Occasionally mixed echogenic foci or hyper echoic gas patterns were observed with in the lesion.

CT SCAN defined the abscess clearly and was able to pick up the subcapsular and peri splenic pathology. It also helps in excluding distal focus and adjacent organ involvement.

In this study, thirteen patients had solitary abscess and remaining patients had multiple abscess.



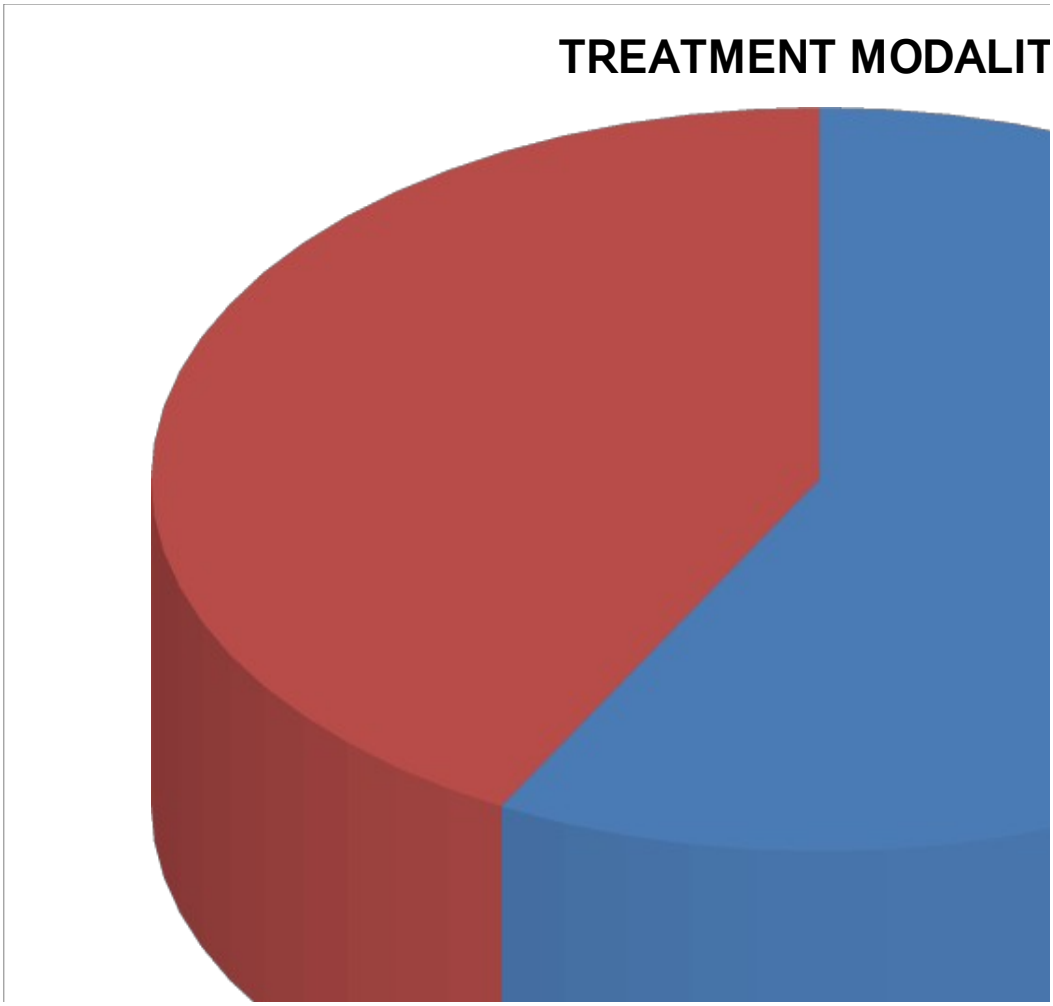
Treatment

All patients irrespective of general condition, received antibiotics. USG guided aspiration and pig tail catheter drainage(8.5Fr) was done in select cases,10 patients underwent guided aspiration and pigtail drainage and recovered with out any complications. Splenectomy was done in 9 cases. Two tuberculosis patients, received anti tuberculosis therapy in addition to splenectomy.

TREATMENT MODALITY

TREATMENT	NUMBER OF PATIENTS
PERCUTANEOUS DRAINAGE& PCD	11 (47.82%)
SPLENECTOMY	09(39.02%)
MEDICAL TREATMENT	23(100%)

Two patients were unwilling for any mode of treatment, because of retroviral status. Mortality was encountered in one patient, who was a known diabetic ,with uncontrolled sugar level and went in for diabetic ketoacidosis.


TREATMENT MODALIT

CONCLUSION

The study involving 23 cases of splenic abscess has highlighted the rarity, varied clinical presentation, Ease of investigative modalities, wide range of microbes causing it, surgical and non surgical option of management. The following conclusions were made:

1. **Splenic abscess is always sequelae of pre-existing disease. Management of splenic abscess is successful only if the primary disease and the abscess are treated at same time.**

2. **Leading cause of splenic abscess is unknown in most of the cases.**

3. **The conventional USG or CT is still the gold standard investigative method of choice.**

4. **Treatment should be carefully planned taking into consideration of patient age, presentation including the general condition of the patient, co morbid conditions and severity of disease.**

5. **The therapeutic management for abscess by non surgical methods in on the rise. This also holds good for draining splenic abscess.**

6. **Surgery in acute splenic abscess needs specialised skills as the chances of adhesions are very high.**

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ANNEXURE

PROFORMA

NAME :

AGE :

SEX :

IN PATIENT NO. :

DATE OF ADMISSION :

DATE OF SURGERY :

DATE OF DISCHARGE :

COMPLAINTS :

H/O. PRESENT ILLNESS :

PAST H/O :

PERSONNEL H/O. :

FAMILY H/O. :

TREATMENT H/O. :

GENERAL EXAMINATION :

SYSTEMIC EXAMINATION : ABDOMEN

P/R :

INVESTIGATIONS

- BLOOD SUGAR, UREA & Sr. CREATININE
- BLOOD TC, DC, Hb PLATELET COUNT
- LIVER FUNCTION TESTS
- SERUM AMYLASE
- URINE ANALYSIS
- X-RAY CHEST PA VIEW
- X-RAY ABDOMEN – ERECT

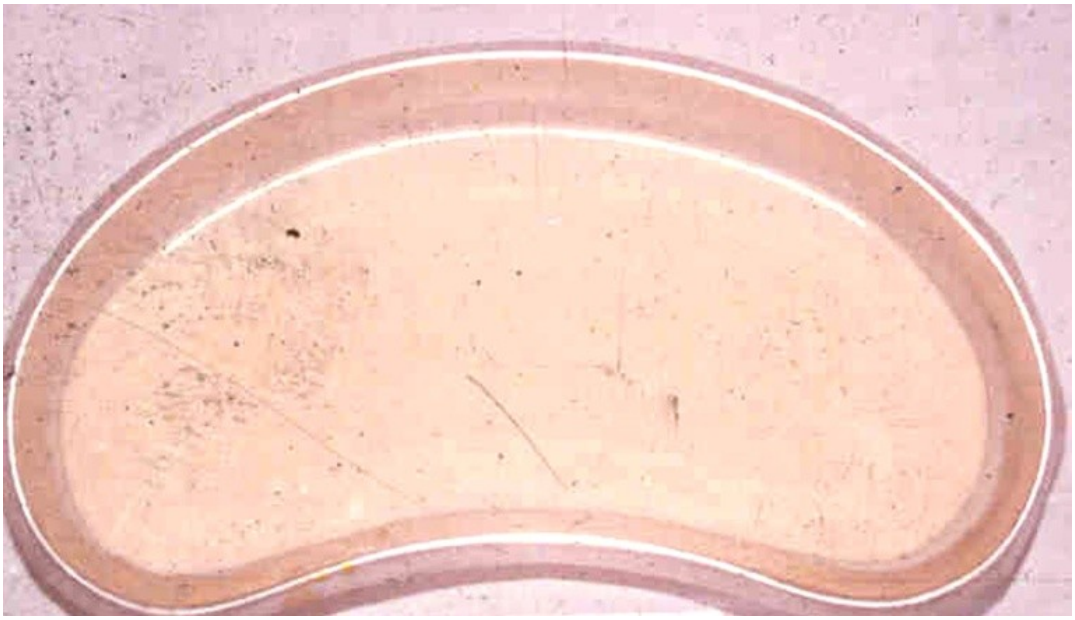
  SUPINE
- ECG IN ALL LEADS
- USG ABDOMEN
- CECT ABDOMEN

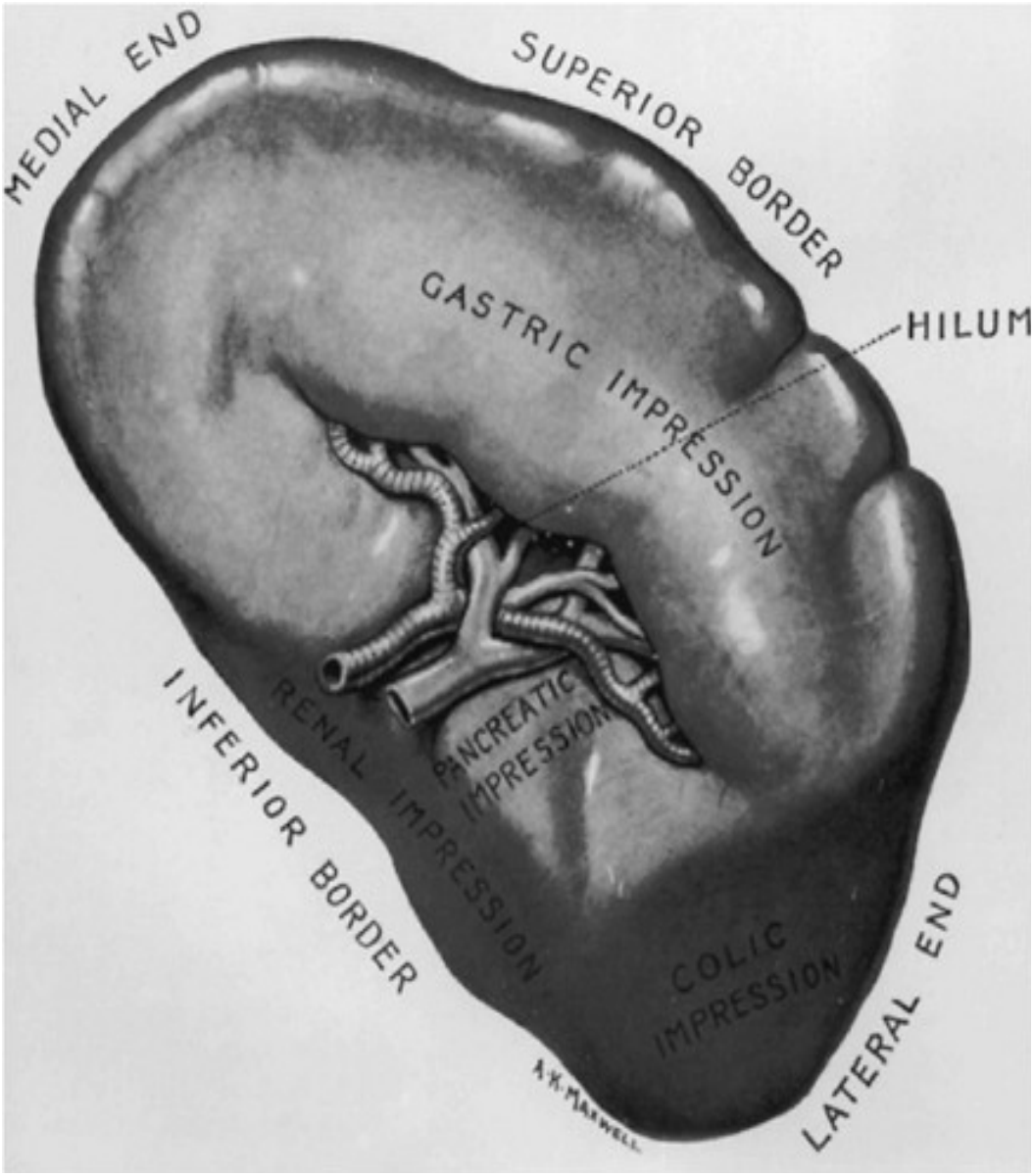
PROVISIONAL DIAGNOSIS-

TRAETMENT-

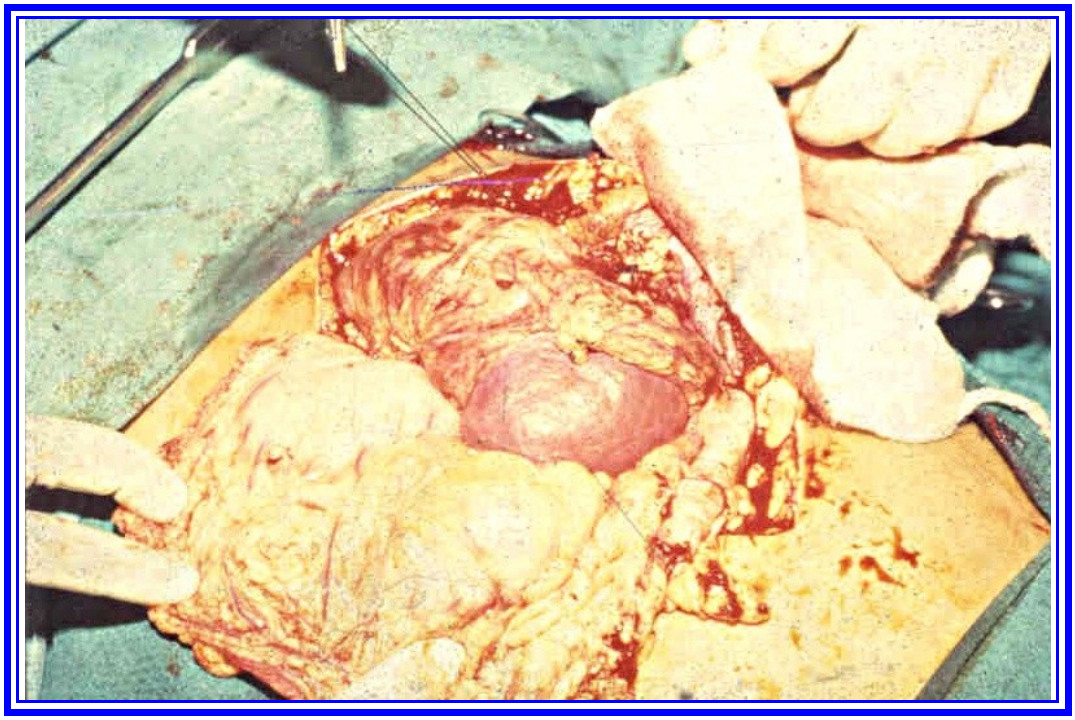
FOLLOW UP-

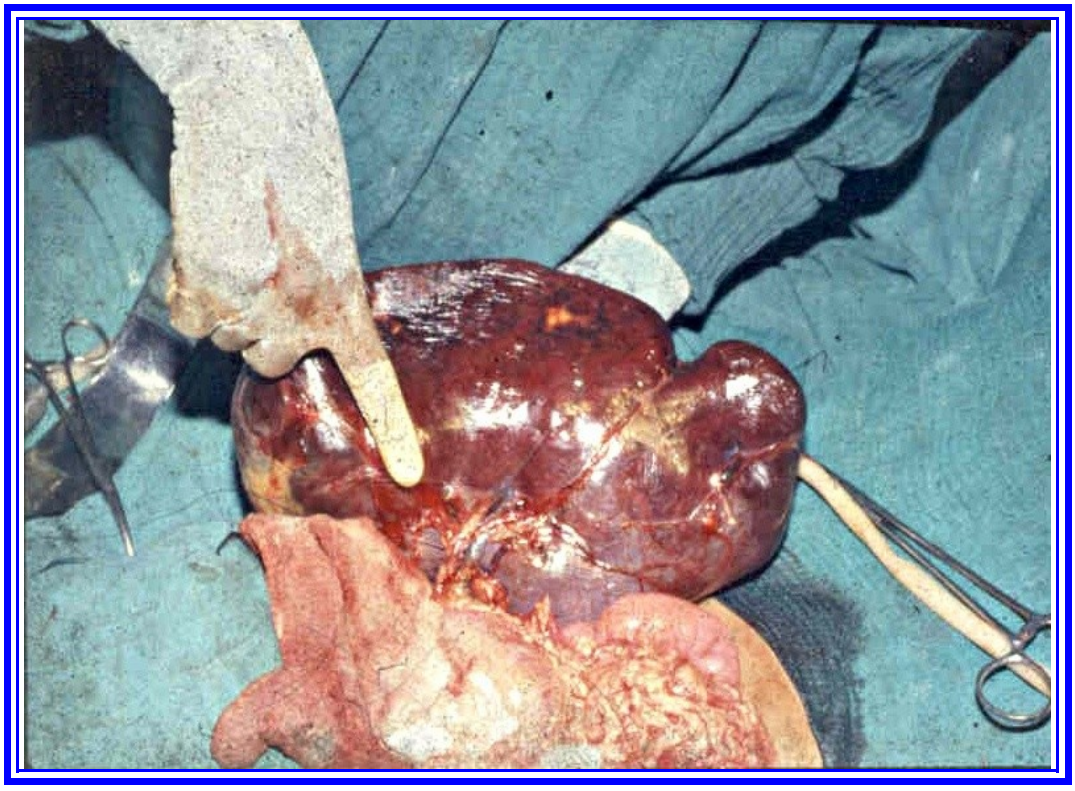
PIG TAIL CATHETER DRAINAGE



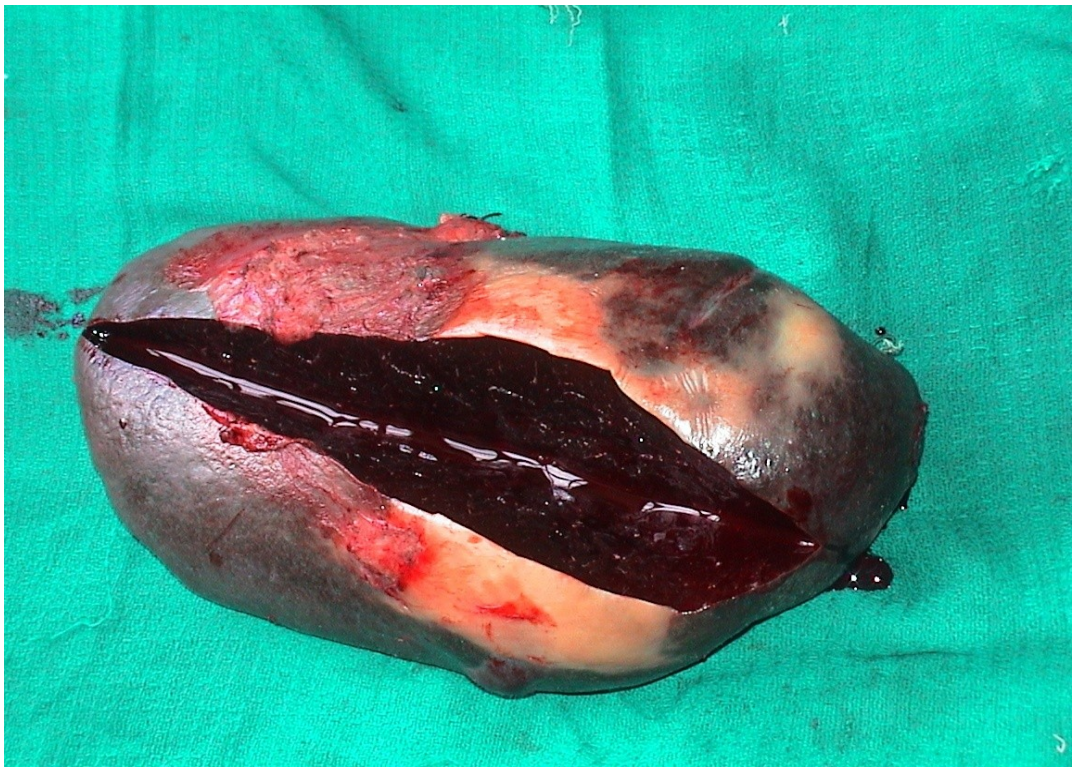

MEDIAL END
SUPERIOR BORDER
HILUM
GASTRIC IMPRESSION
PANCREATIC IMPRESSION
RENAL IMPRESSION
INFERIOR BORDER
COLIC IMPRESSION
LATERAL END
A.H. MAXWELL

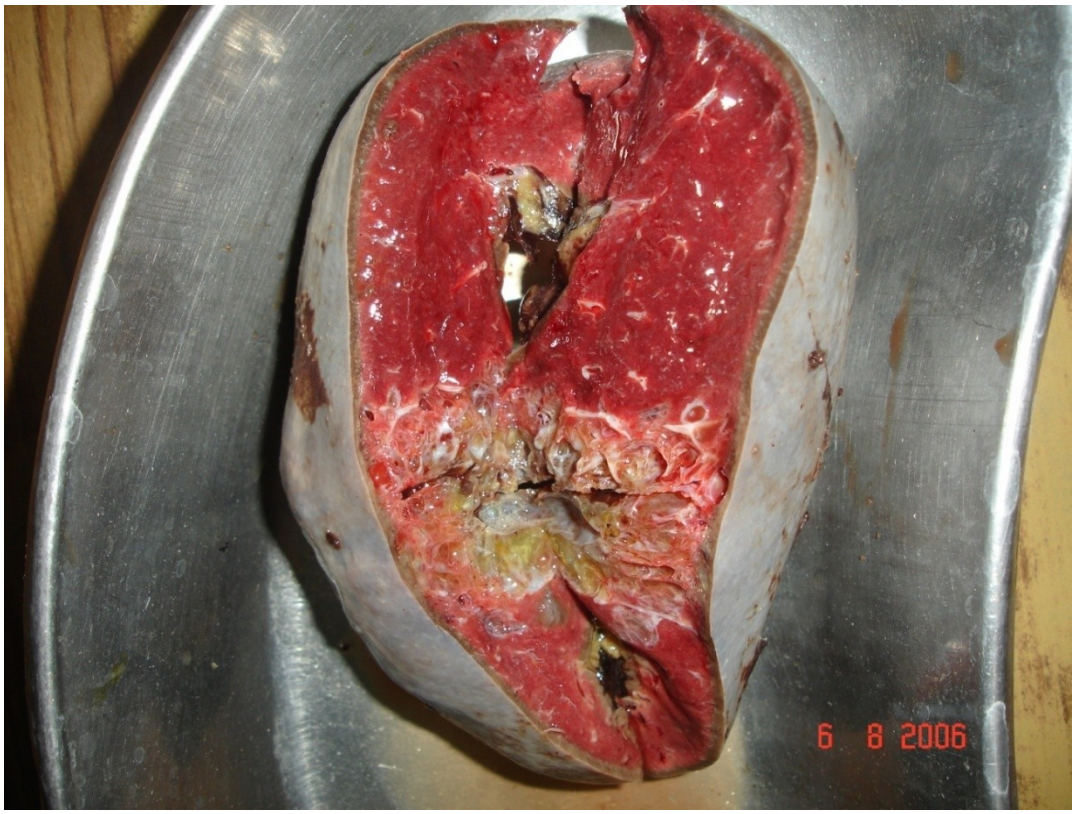
INTRA OPERATIVE PICTURE SHOWING ADHESIONS



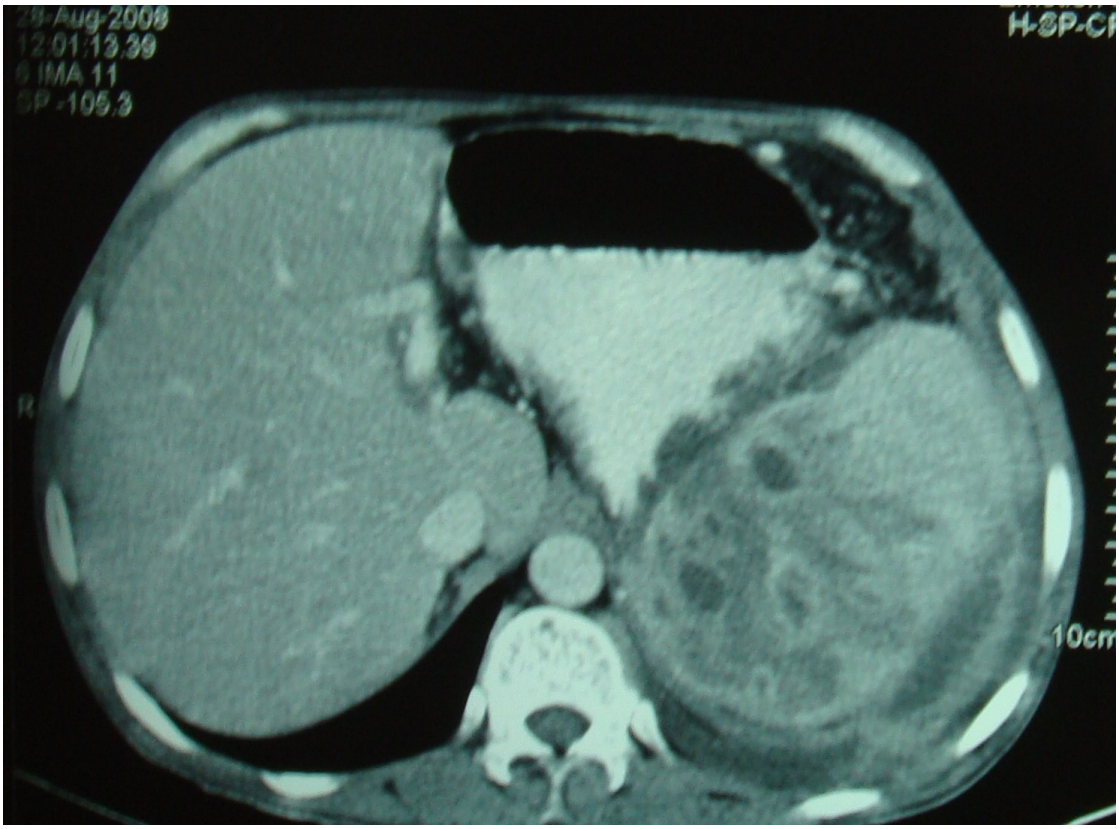


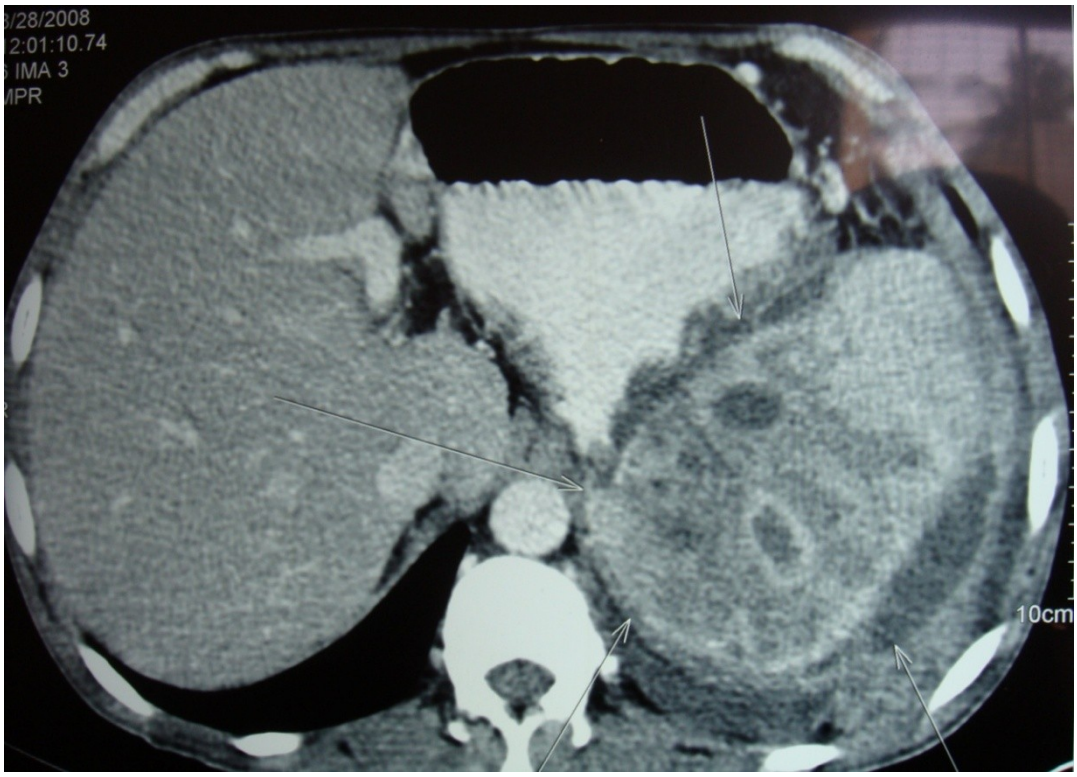
CUT SECTION OF RESECTED SPLEEN



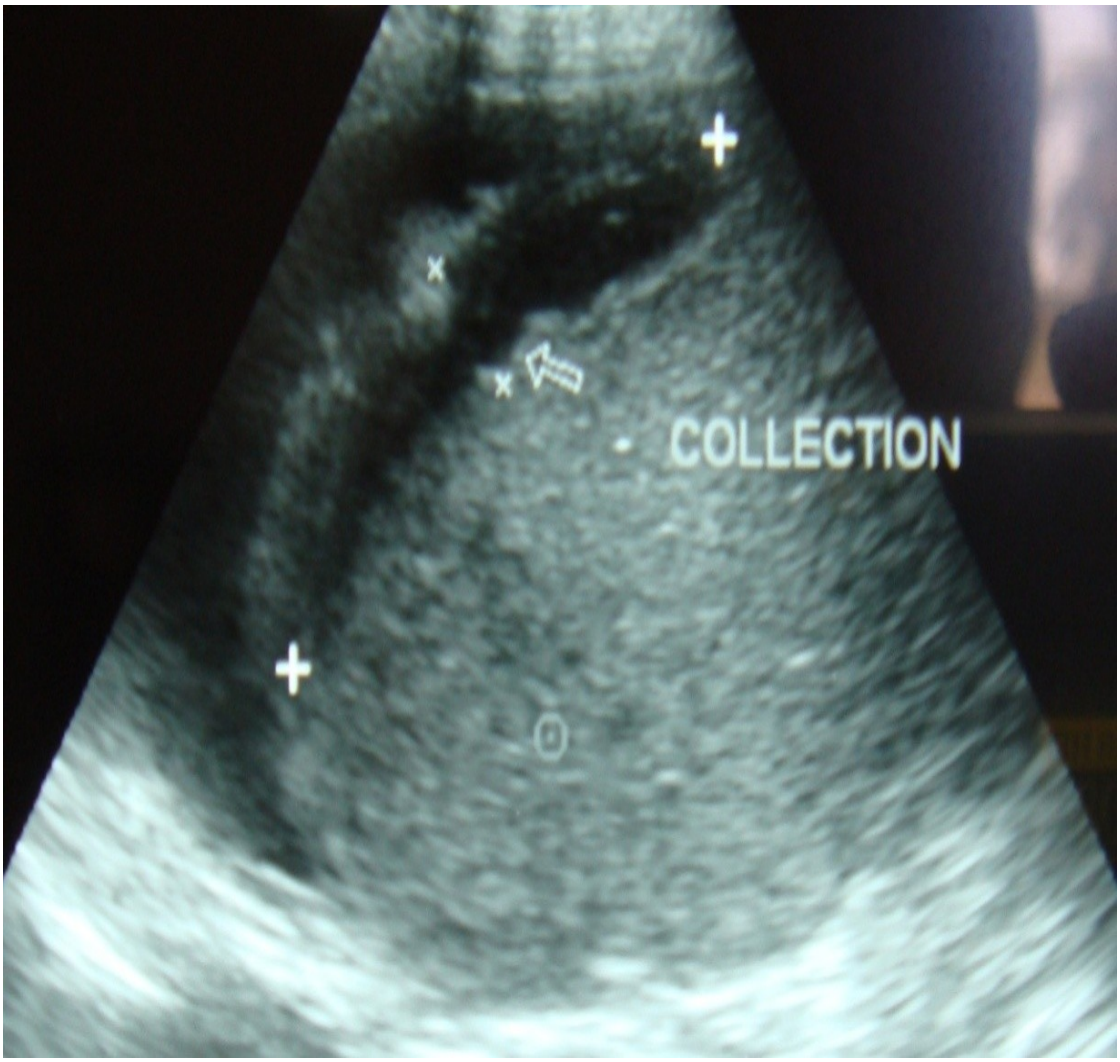


C T ABDOMEN SHOWING MULTIPLE ABSCESSES





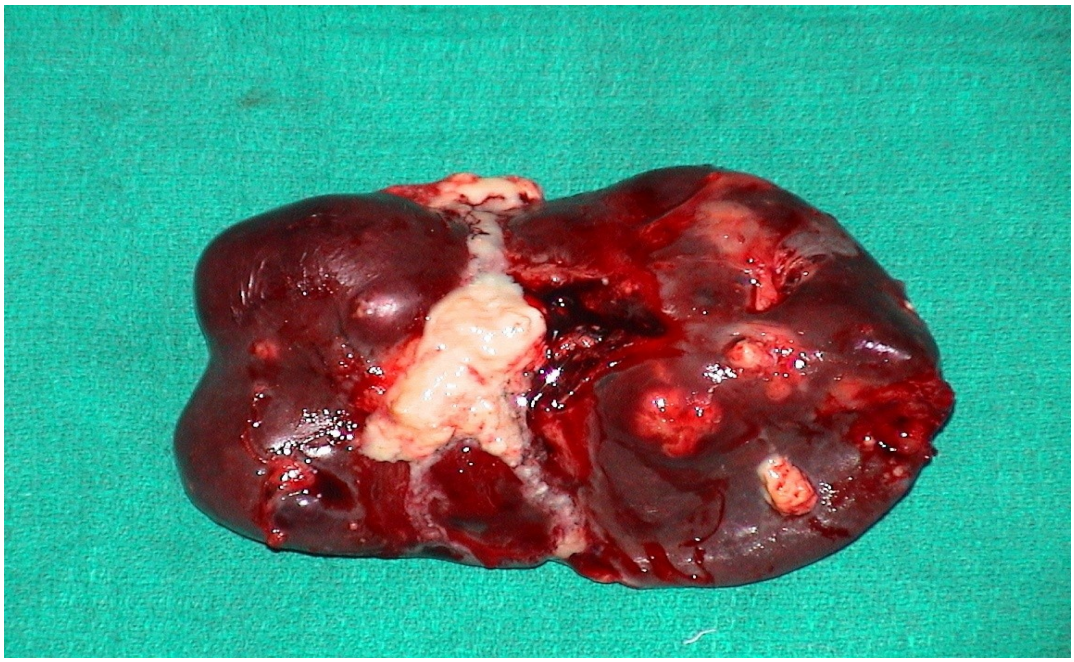
USG SHOWING ABSCESS

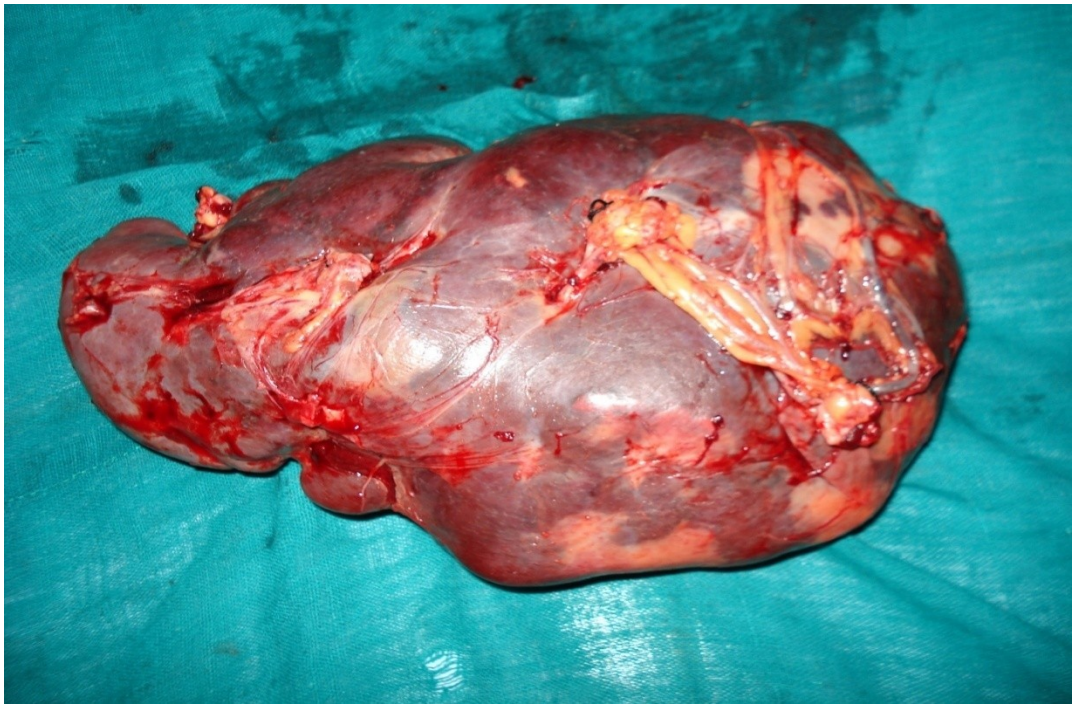


CT SCAN SHOWING SPLENIC ABSCESS WITH PIGTAIL IN SITU

PIG TAIL CATHETER

RESECTED SPLEEN SHOWING ABSCESS





RESECTED SPLEEN